PRELIMINARY
Interim Hydromodification Management Plan

Otay Business Park

TM 5505
Environmental Log No. 93-19-006W

February 2010

Prepared for:
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4225 Executive Square
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Prepared by:
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KHA No. 095529000

DECLARATION OF RESPONSIBLE CHARGE

I, hereby declare that I am the Civil Engineer of Work for this project. That I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with current standards.

I understand that the check of project drawings and specifications by the County of San Diego is confined to a review only and does not relieve me, as Engineer of Work, of my responsibilities for project design.

_____ _____

Matthew Barlow R.C.E. 62906 Date

Kimley-Horn
and Associates, Inc.

TABLE OF CONTENTS

EXHIBITS

APPENDICES

Kimley-Horn
and Associates, Inc.

1.0 Introduction

The proposed project involves the development of 161 acres in the East Otay Mesa area of San Diego. The project site is located southeast of the future intersection of Alta Road and Airway Road and immediately north of the U.S./Mexico border. The site involves the mass grading of approximately 59 "mixed industrial" pads, half width improvements of Alta Road fronting the project and extending approximately 2600' to the north, and extending Siempre Viva Road and Airway Road approximately 1200' to the west.

In 1990, the State Water Resources Control Board (SWRCB) issued a National Pollutant Discharge Elimination System (NPDES) permit that regulates stormwater discharges. The permit required the use of Best Management Practices (BMPs) to control the discharge of pollutants to waters of the United States. In January 2007, a new Municipal Separate Storm Sewer Systems (MS4) permit, Order R9-2007-0001, was adopted to renew the NPDES permit. The permit directed the copermitees within the County of San Diego to enforce new stormwater discharge requirements by March 2008. Order R9-2009-0007 is based on the federal Clean Water Act (CWA), which prohibits the discharge of any pollutants that impair waterways.

The most significant new requirements include requiring, Low-Impact Development (LID) BMPs, medium/high treatment control BMP effectiveness, and a Hydromodification Management Plan. Low Impact Development (LID) is a required approach to reduce stormwater runoff rates and durations. The technique emphasizes mimicking natural hydrologic conditions through promoting infiltration. The first goal of LID is to reduce the generation of storm water runoff. The second goal is to treat pollutants where they are generated by evenly distributing the management of storm water throughout the site. Selected treatment BMPs must have a medium or high removal efficiency rating or have a treatment train. Any BMPs with low/medium removal efficiency will require an additional BMP placed in series in order to capture pollutants that pass through the first treatment device. The Otay Business Park Storm Water Management Plan further discusses water quality treatment.

The Final Hydromodification Plan will be adopted in 2010; until then, the Interim Hydromodification Criteria must be met for projects priority projects over 50 acres. Hydromodification refers to changes in the natural flow pattern (surface flow or groundwater) of an area due to development. Land development impacts include increasing impervious surface, decreasing vegetation, soil compaction, and construction of drainage facilities. The effect of these actions on runoff is less infiltration, increased volume, and increased duration. Storms that previously didn't produce runoff under pre-project conditions can produce erosive flows post-project. Ultimately, the receiving water stream bank is eroded with an increase in volume of runoff and the length of time that flows occur. Hydromodification can be managed by reducing runoff flow and volume with LID practices. LID practices and facilities reduce the need for stormwater control facilities.

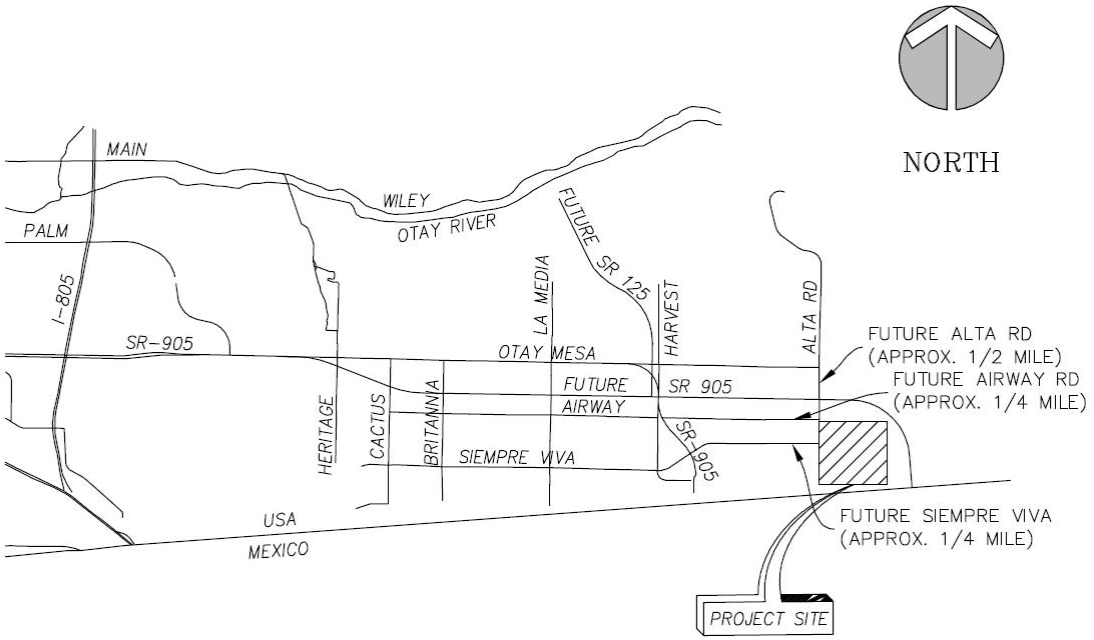

Figure 1: Vicinity Map

2.0 Existing Conditions

The existing site has two tributary drainage basins with the drainage divide down the middle of the parcel in a north/south direction see **Exhibit A-Conceptual Proposed Detention Basins**. The drainage basins are identified as the east and west basins. The total tributary area contributing runoff flows to the west basin is 309 Ac., approximately 92 Ac. of this area is within the project boundary. The total tributary area contributing runoff flows to the east basin is 711 Ac., approximately 73 Ac. of this area is within the project boundary.

The site currently consists of open fields with medium vegetation and was previously used for agricultural purposes. Existing runoff is currently conveyed in a series of existing drainages swales in a natural flow condition across the site and flows across the border through culverts. Per the County of San Diego Hydrology Manual, June 2003 the soil classification for the site is Soil Type D.

3.0 Proposed Conditions

The proposed project will provide several locations to pick up offsite flows from the north. See *Otay Business Park Hydrology/Drainage Study* by Kimley-Horn and Associates dated July 2008 for more details**.** Offsite flows draining toward the west basin will be captured and conveyed in an underground drainage system in Alta Road. This system will also be used to convey runoff from the proposed Siempre Viva Road, Airway Road, and Alta Road extensions. This

underground drainage system has been provided to bypass offsite flows through the proposed site separating proposed onsite flows from the offsite runoff. The offsite street improvements, including the extension of Siempre Viva Road, Airway Road, and Alta Road, is captured in the onsite storm drain which drains into the west detention basin.

Offsite flows captured just north of the east basin will be conveyed through the site using a natural lined channel. The natural lined channel will only be used to convey offsite flows separating the proposed onsite flows from the offsite flows.

Curb inlets and desilt basins will be used to capture onsite flows. A series of underground drainage systems will be provided to route flows to two detention basins located at the southwest and southeast corners of the project. The detention basins will be used to detain the developed flows back to existing conditions for peaks and durations per interim hydromodification criteria. The detained flows will be released offsite to the south maintaining the original drainage flow path and avoiding diversion of flows.

4.0 Methodology

The Interim Hydromodification Criteria requires post-project runoff durations and peak flows to not exceed pre-project durations and peak flows. Specifically, the post-project discharge duration between 20% of the 5 year flow (0.2Q5) to the 10 year flow must not exceed the pre-project durations by more than 10% over more than 10% of the flow duration curve. Post-project peak flow rates between 0.2Q5 to Q5 must not exceed pre-project peak flows. Flow rates between Q5 to Q10 may not exceed pre-project flows by up to 10% for a 1-year frequency interval.

The San Diego Hydrology Model (SDHM) software was used to analyze the proposed project for compliance with the San Diego County Interim Hydromodification Criteria. This software is capable of modeling hydromodification management or flow control facilities to mitigate the effects of increased runoff from proposed land use changes that may have negative impacts downstream.

SDHM is based on actual recorded precipitation data. For this project the nearest precipitation gauge was at the Lower Otay Station with precipitation data 1959-2004. Although the Lower Otay rainfall station is the closest in proximity to our project, we found that it does not accurately represent this project. The isopluvial maps and precipitation zone maps provided in the San Diego County Hydrology Manual provide a comparison of rainfall zones across the County. When the proposed project location is plotted on this map, along with the location of the Lower Otay rain gauge, it is apparent that they are in very different rainfall zones. In order to better represent the rainfall at the proposed project, the Lower Otay rainfall data was scaled by a factor of 1.3. The scale factor was determined by the difference in the project's isopluvial value and the Lower Otay Station isopluvial divided by the Lower Otay Station isopluvial. See **Appendix A** for additional information, including isopluvials and Figure C-1 (PZN Map) with the project location noted.

The program is a continuous simulation program accounting for all storm events which differs from typical methods of using the peak from a single storm event such as 50-yr, 100-yr, etc. SDHM uses the Hydrologic Simulation Program-Fortran (HSPF) software as its computational

engine to run rainfall-runoff algorithms. The program HSPF generates hourly runoff time series from the available rain gauge data over number of years is supported by the EPA and USGS. SDHM has taken HSPF and calibrated the parameters for San Diego. Calibration is based on simulated and observed values. Frequency is calculated based on the peak outflow for each year. The peak outflows are ranked and assigned a return period (years) based on the Weibull plotting position:

Return period = N/(m+1)

Where: N= number of years

m= rank

Flow Control Analysis and Sizing

Pre-project and post-project model scenarios for the project site were created. The pre-project model consists of two basins (east and west) with the landuse defined as Soil C/D with a flat 0-5% grass surface and Soil C/D with flat 0-5% dirt surface. The existing site is relative flat, with approximately 30% dirt and 70% natural grass/vegetation based on aerial photographs.

Post-project model basins consist of impervious roads and industrial use parcels. Although this project proposes street improvements and graded pads, the graded pads are modeled for the ultimate "mixed" industrial use. Per the County of San Diego Hydrology Manual (June 2003), industrial use parcels are 72% impervious. The MS4 permit requires all developments to include LID features. The hydromodification management plan models the proposed lots in ultimate condition. Due to mandatory LID measures, the industrial use parcels are modeled as 70% impervious. The future developer of the graded lots must incorporate LID techniques into their project to comply with hydromodification standards. At the time of development, the developer must demonstrate the LID techniques proposed are at a minimum equivalent to this model. Various LID techniques such as permeable pavement, dispersion, green roofs, rainwater harvesting, flow-through planter, bioretention area, or grass swales are available. The 70% impervious area from the parcels was divided between roof area and parking area.

The water quality runoff from the proposed impervious roads will be directed into grass swales within the right-of-way. Vegetated swales are shallow channels that collect and convey runoff slowly. Runoff is filtered through the vegetation to trap pollutants, promote infiltration, and reduce the flow velocity of the stormwater runoff. Grass swales have not been modeled in SDHM because the grass swales will be designed only to capture the water quality runoff (first flush). The pervious area from the swales accounts for approximately 5% of the dedicated road right-of-way; this was entered into the model as soil C/D grass (slope 0-5%).

In addition to the LID techniques, ponded storage is required to detain the flows to 20% of the five year design flow. Flow control techniques were sized iteratively through SDHM in order to reach hydromodification compliance. The volume of detention basin size was based on allowable discharge. The precipitation data for the scaled Lower Otay produced the 5-year existing condition flows of 6.91 cfs for the east basin and 8.68 cfs for the west basin. The 10-year existing condition flow is 10.89 cfs for the east basin and 13.67 cfs for the west basin. San Diego County does not experience large rainfall events; therefore, the returned 5-year frequency runoff is relatively small. Twenty percent of the five year discharge (0.2Q5) generated from the model is 1.38 cfs from the east basin and 1.74 cfs from the west basin; this is the maximum discharge allowed. See **Table 1** for pre-developed flows.

Table 1: Peak Requirement Pre-developed vs. Mitigated

Flow Frequency	East Basin*		West Basin*	
	Flow (cfs)			
	Pre-developed	Mitigated	Pre-developed	Mitigated
2 Year	0.25	1.10	0.31	1.56
5 Year	6.91	1.31	8.68	2.05
10 Year	10.89	10.53	13.67	3.13
25 Year	29.34	16.00	36.84	13.32

* Onsite tributary areas for the east and west basins are approximately 73 and 92 acres, respectively

The function AutoPond in SDHM automatically sizes the pond to meet the required flow duration. The west basin requires 17.9 ac-ft of storage and the west basin requires 31.3 ac-ft of storage to comply with hydromodification requirements (see **Appendix B**). The surface area of the east basin is 1.4 acres and the surface area of the west basin is 4.0 acres. The surface area of the detention ponds are subtracted from the overall acreage. **Figure 2** and **Figure 3** demonstrate the interim hydromodification duration requirement is not exceeded provided the following detention basins are incorporated (see **Table 2)**.

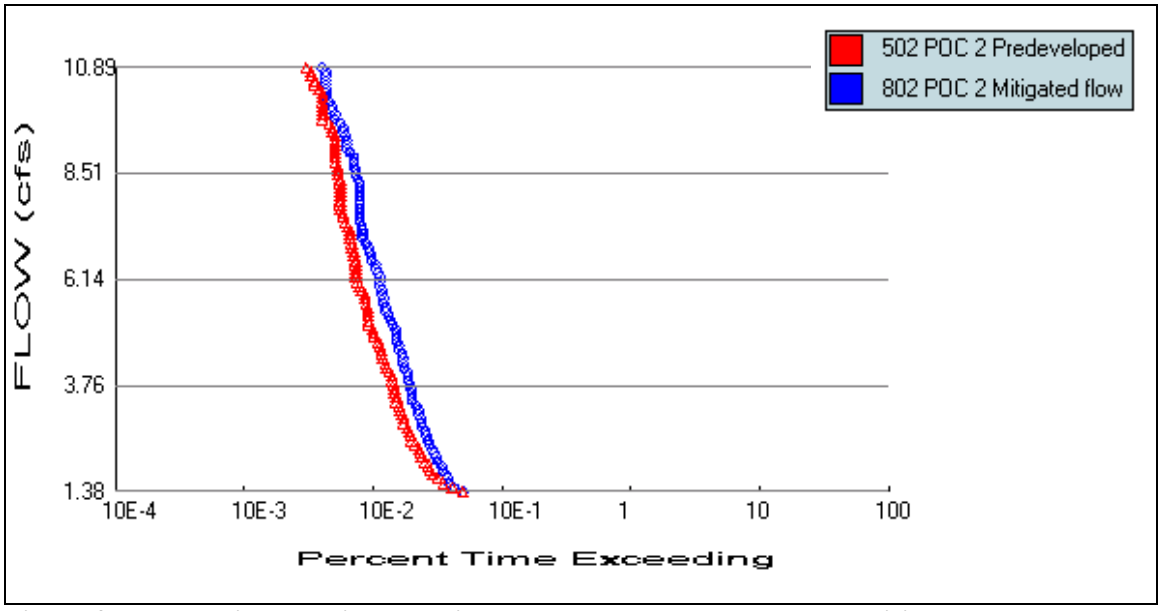

Figure 2: East Basin Duration Requirement Pre-developed Flow vs. Mitigated Flow

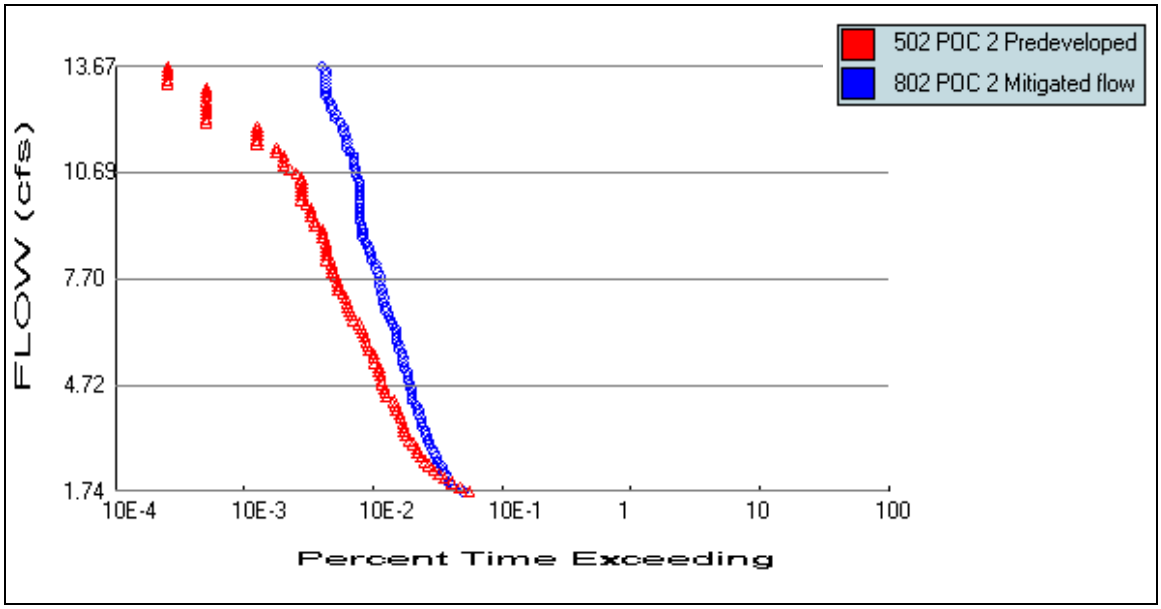

Figure 3: West Basin Duration Requirement Pre-developed Flow vs. Mitigated Flow

Table 2: Detention Basin Properties

Detention Basin Properties	East Basin	West Basin
Volume (ac-ft)	18.5	32.5
Surface Area (acres)	1.4	4.0
Depth (ft)	17.8	9
Orifice (inches)	3.6	4.7
Drawdown Time (days)	9.0	16.0

The two detention basins for this project are required to meet the new interim hydromodification requirements and flow control detention criteria. The hydromodification requirements restrict the duration of the existing storm between 0.2Q5 and Q10 and peak flow between Q5 and Q10. Flows greater than Q10 is not subject to hydromodification; however, the peak existing discharge from the rational method may not be exceeded. In this case, the hydromodification requirements govern. The 50-year and 100-year hydrographs produced by the rational method presented in the *Otay Business Park Hydrology/Drainage Study* dated January 2010 by Kimley-Horn and Associates, pass through the detention basins with more than 1 foot of freeboard. See Hydrology/Drainage Study for additional information regarding discharge rates for the 50 and 100-year rational method storms.

The drawdown time is the time it takes for the basin to empty when completely full. The SDHM program calculates the drawdown time for the detention basins in the result analysis; however, the program's calculated drawdown time does not accurately reflect the detention basin's operation. The program's drawdown time calculation is maxed at 5 days. The drawdown time was manually calculated using Microsoft Excel and the stage versus discharge values exported from SDHM. The time of discharge was calculated at each stage and summed for the total time; see **Appendix B** for the drawdown time calculation. The drawdown time for the east basin is 9 days and the drawdown time for the west basin is 16 days.

The drawdown time for the detention basins required to meet the hydromodification criteria exceeds the 72 hour maximum residence time recommended in the San Diego County Drainage Design Manual. A 72 hour maximum residence time is recommended for detention basins to prevent mosquito development. The County of San Diego Low Impact Development Handbook addresses vector control by referencing the article "Managing Mosquitoes in Stormwater Treatment Devices" written by Marco Metzger from Vector-Borne Disease Section of the California Department of Health Services. The article recommends mosquito monitoring and control for structures that hold water over 72 hours. A Vector Control Plan for the two detention basins is provided in **Appendix C**.

Partial Duration

The peak flow frequency statistics, i.e. Q5 and Q10, estimates how often flow rates will exceed a given threshold. There are two common methods to determine the frequency of recurrence of flood data: annual maximum series or partial duration series. The annual maximum series selects the highest peak discharge in one year. The partial duration series considers multiple storm events in a given year. The SDHM program calculates flow frequency based on selecting annual peak flow values. The Brown and Caldwell memo "Using Continuous Simulation to Size Storm Water Control Facility" dated May 2008 notes that peak annual series may not accurately represent San Diego County's semi-arid environment.

In order to determine the most appropriate method, the Annual Maximum Series and Partial Duration Series method was used to compute the Q5 and Q10 for the project's east basin for comparison. The Annual Maximum series was produced in SDHM and the Partial Duration Series was computed using Microsoft Excel. All the hourly flow data generated for pre-developed conditions in SDHM were extrapolated using the EPA's WDMUtil program and imported into Microsoft Excel. The hourly data for 45 years of rainfall data generates approximately 395,200 time steps of simulated data. The time series were divided into sets of discrete unrelated events. The discrete rainfall events were set following the following criteria from the San Diego Final Hydromodification Plan, December 2009:

- To determine a discrete rainfall event, a lower flow limit was set to a very small value, equal to 0.002 cfs per acres of contributing drainage area.
- A new discrete event is designated when the flow falls below 0.002 cfs for a time period of 24 hours.

Applying these criteria, 74 discrete rainfall events were defined over 45 years. The rainfall events range in time from 1 hour to 642 hours. The maximum peak flow for each rainfall event was determined and ranked. The highest peak flow was ranked number one. Then the recurrence interval was computed following the equations in the article "Annual Floods and the Partial-Duration Flood Series" by W.B. Langbein dated 1949. The return period equation is summarized below:

Return Period, (years) = $1/1-e^{-\varepsilon}$

Where: $\varepsilon=m/N$

m=rank

N=number of years

This plotting distribution was compared to the Weibull Plotting Position, both computed flow frequencies within 5% of one another. The Partial Duration Series slightly increases the flow

frequency for smaller rainfall events; however, the difference is minimal. See **Table 3** for comparison. Based on these results, the flow frequency calculated using the Annual Max Series provides a reasonable estimation of rainfall events.

Table 3: Annual Max versus Partial Duration for Flow Frequency

Flow Frequency	East Basin Pre-developed (cfs)	
	Annual Max Series	Partial Duration Series
0.2Q5	1.4	1.7
Q5	6.9	8.3
Q10	10.9	13.1
Q25	29.3	28.9

5.0 Results

Hydromodification management was required for this project to prevent downstream erosion caused by land development. Ultimate use for the 165 acre project site consists of arterial roads and "mixed" use industrial parcels. Compliance with the interim hydromodification criteria was demonstrated using the continuous simulation program SDHM. The post-project scenario was modeled for ultimate use to determine flow control devices. Flow controls required include LID and ponded storage. Runoff from the streets is directed to grass swales for water quality. Industrial use parcels will require LID when fully developed; therefore, the typical 72% impervious area is assumed to be 70% impervious. LID practice alone does not meet hydromodification flow duration requirements because they do not perform well during large runoff events. Two detention basins (one east and west) are required to reduce runoff peaks and durations. The area of the detention ponds was subtracted from the overall acreage. Tables 1 and 2 previously provide a summary of these results.

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APPENDICES

Kimley-Horn
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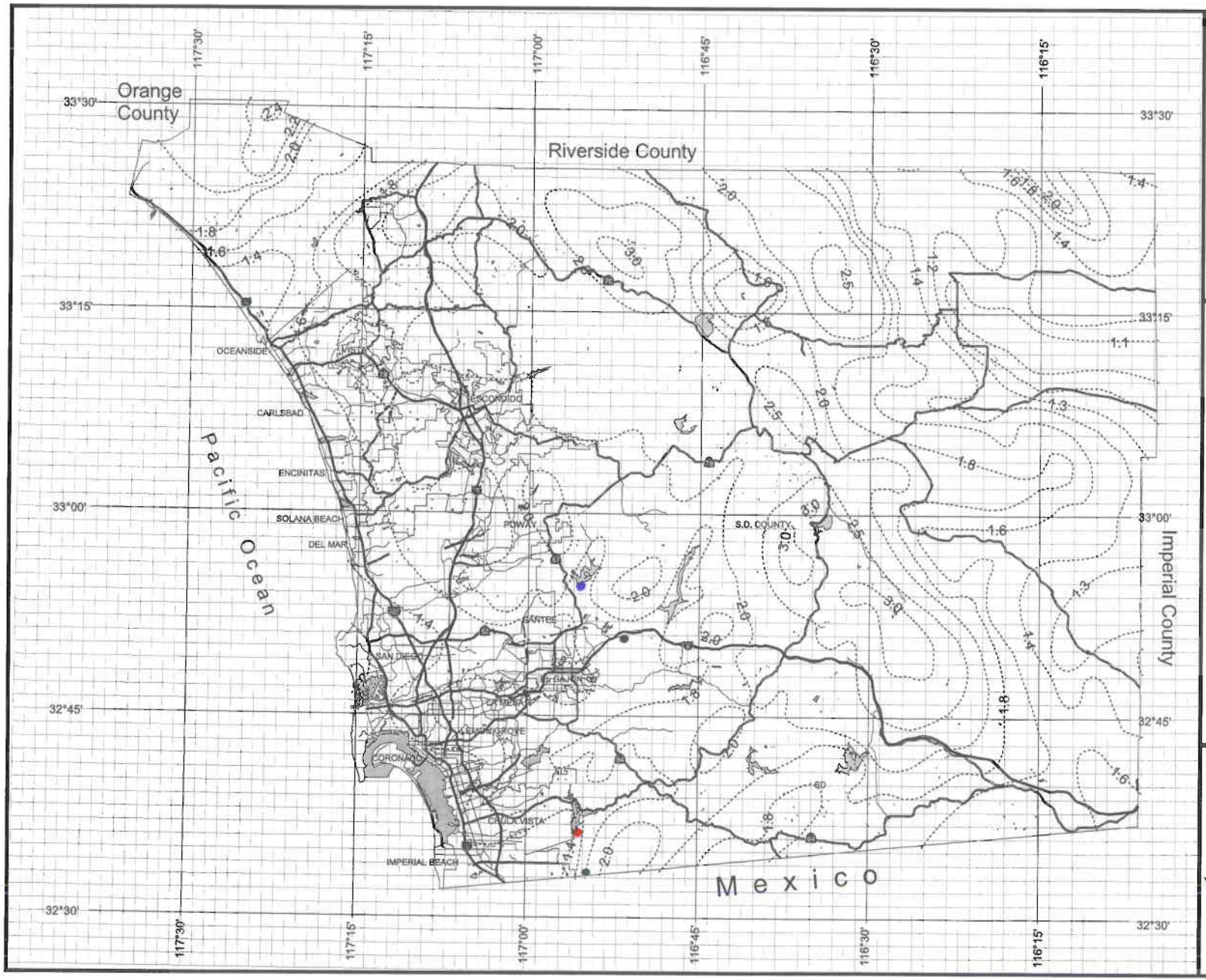
Appendix A ~ Rainfall Data

County of San Diego Hydrology Manual

Rainfall Isopluvials



5 Year Rainfall Event - 6 Hours

Isopluvial (inches)

- Lower Otay Res = 1.4 Station
- Otay Business = 1.8 Park
- San Vicente = 1.8 Station
- Flinn Springs = 1.8 Station

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Department of Public Works Geographic Information Services

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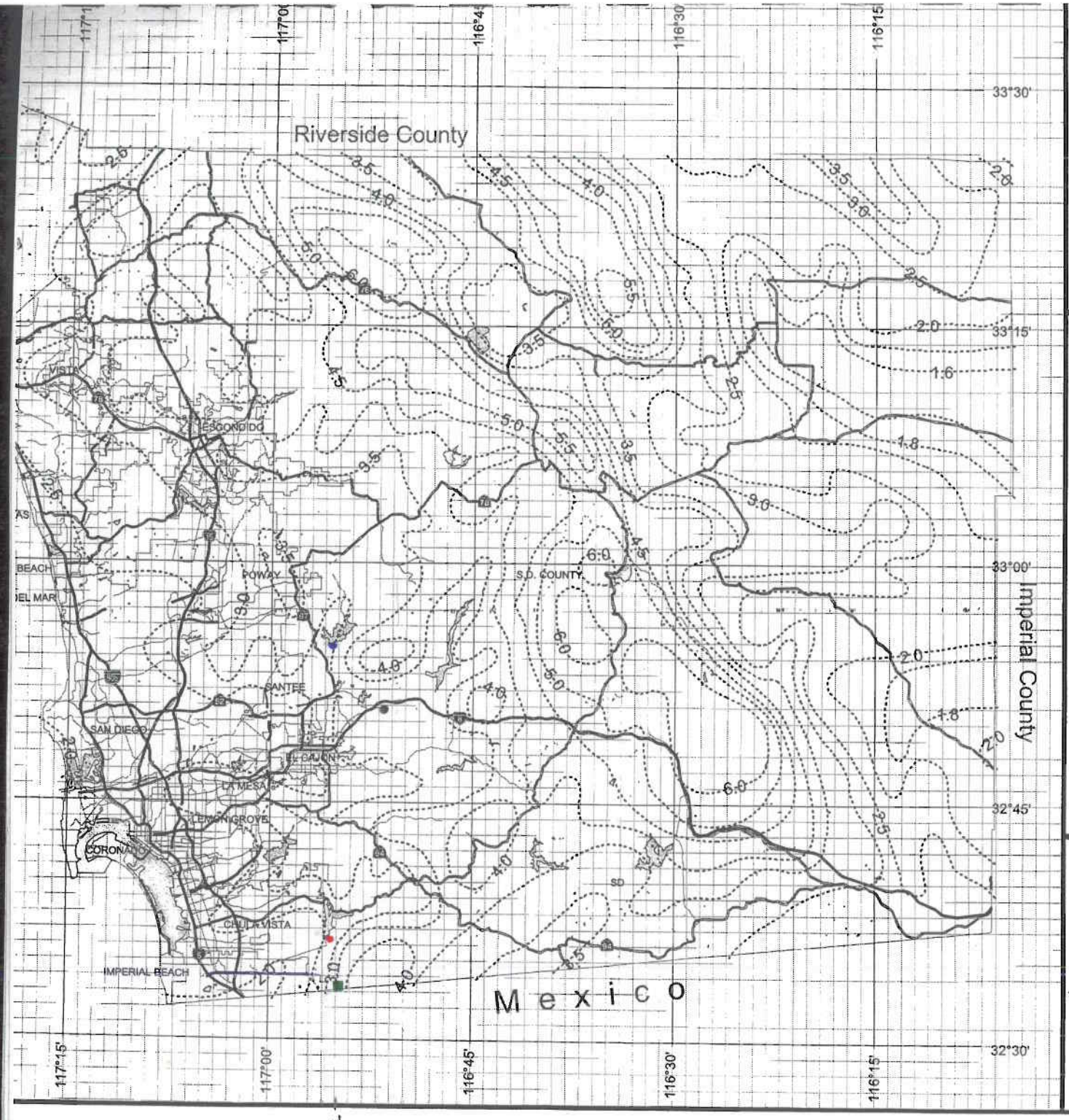
3 0 3 Miles

County of San Dieg Hydrology Manual

Rainfall Isopluvials



5 Year Rainfall Event - 24 Hours

Isopluvial (inches)

- Lower Otay Res = 2.7 Station
- Otay Business = 3.6 Park
- San Vicente = 3.0 Station
- Flinn Springs = 3.2 Station

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Geographic Information Services

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3 0 3 Miles

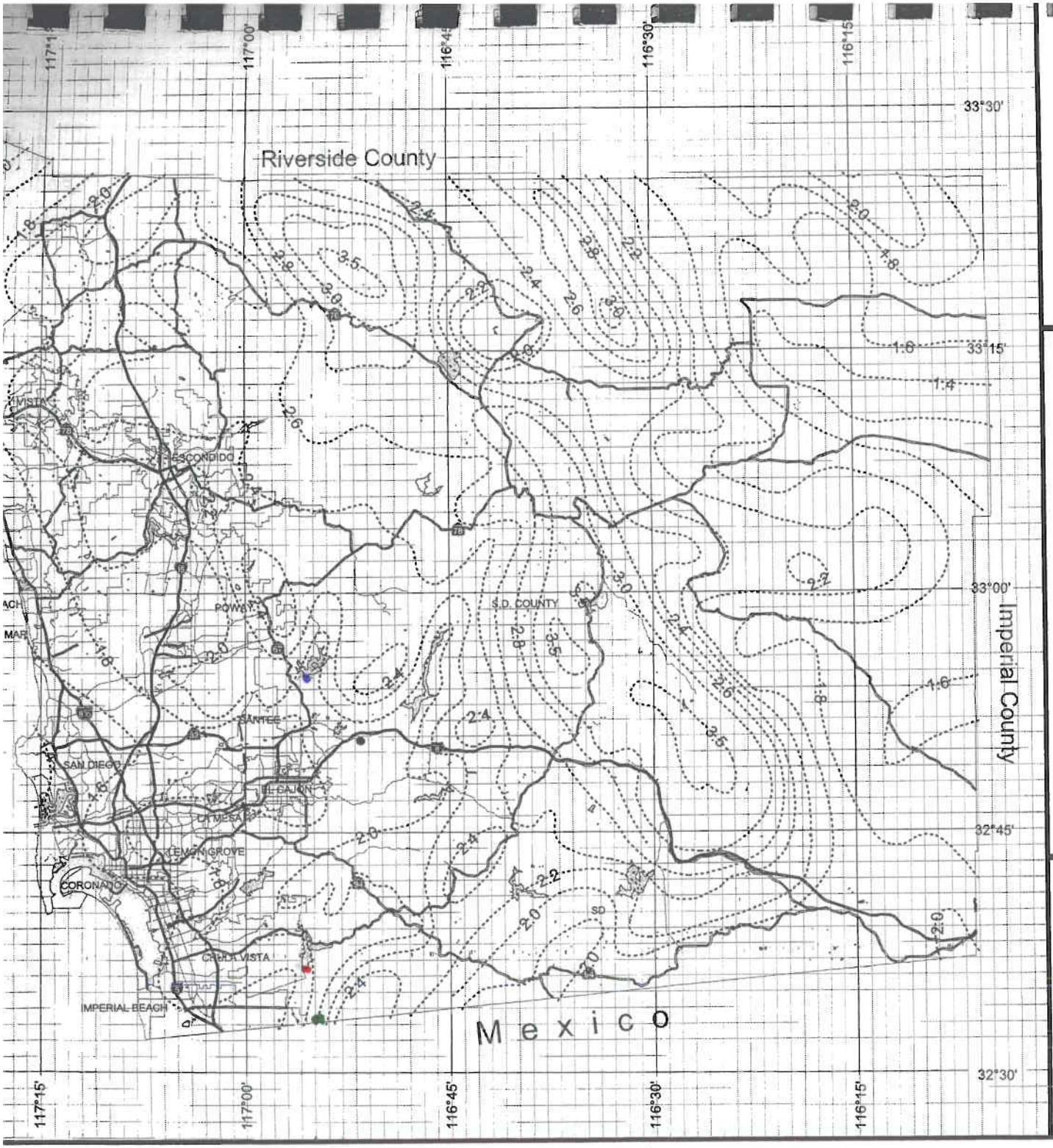
County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 6 Hours

Isopluvial (inches)

- Lower Otay Res. = 1.75 Station
- Otay Business Park = 2.0
- San Vicente Station = 1.95
- Flinn Springs Station = 1.95



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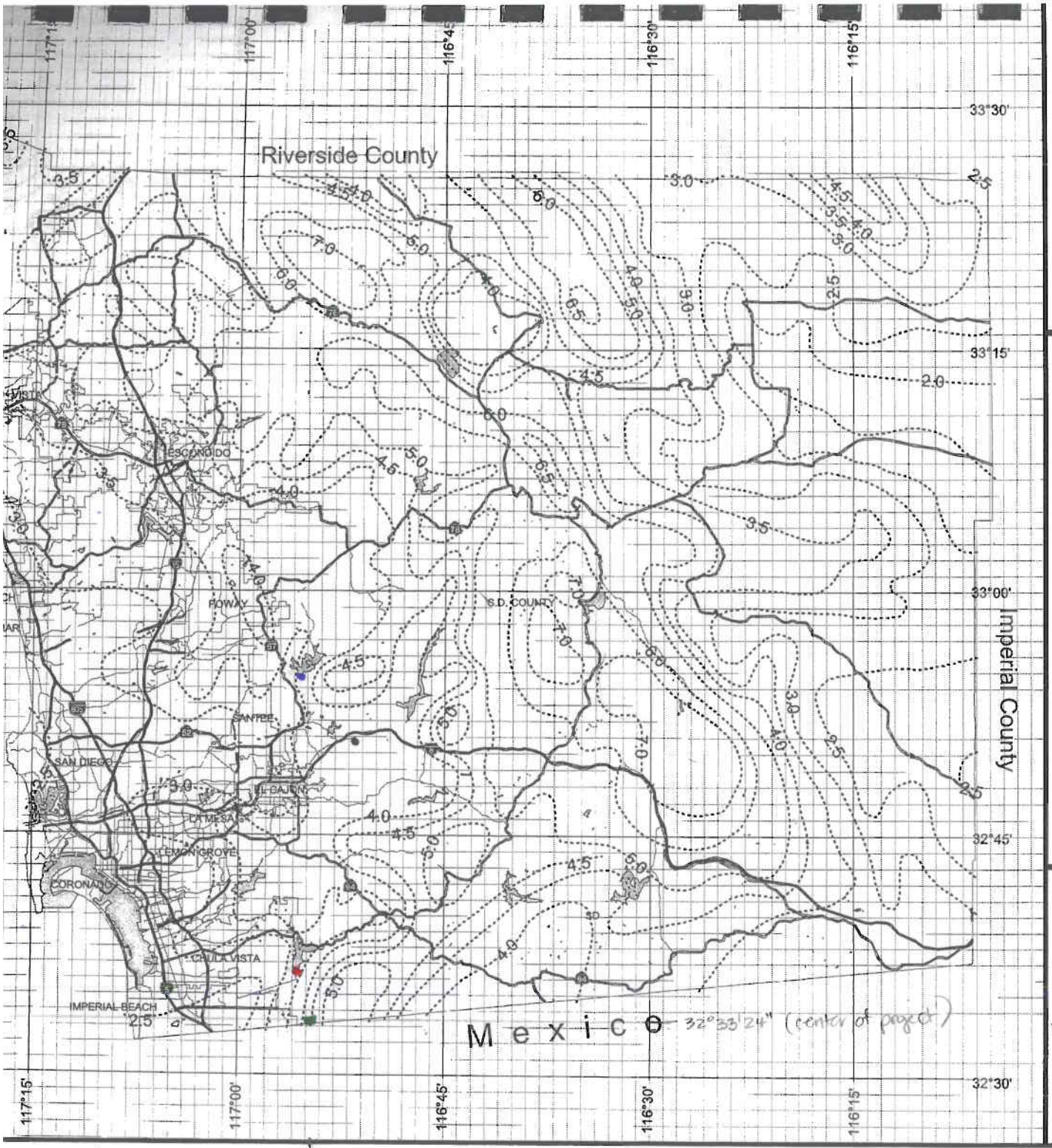

116°59'50" (center of project)

County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 24 Hours

Isopluvial (inches)

- Lower Otay Res Station = 3.4
- Otay Business Park = 4.3
- San Vicente Station = 3.6

Flinn Springs = 3.8 Station

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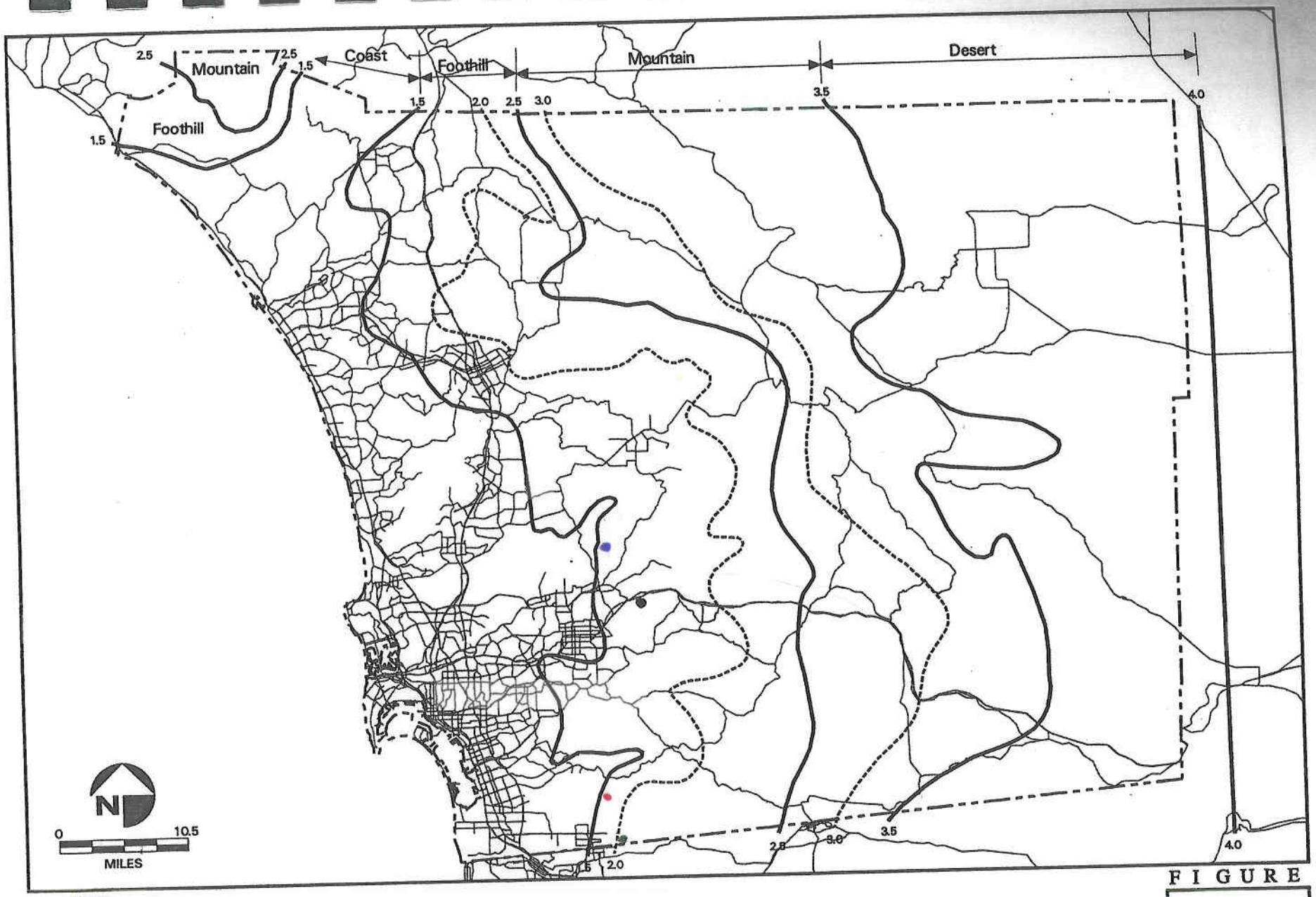
3 0 3 Miles



FIGURE

C-1

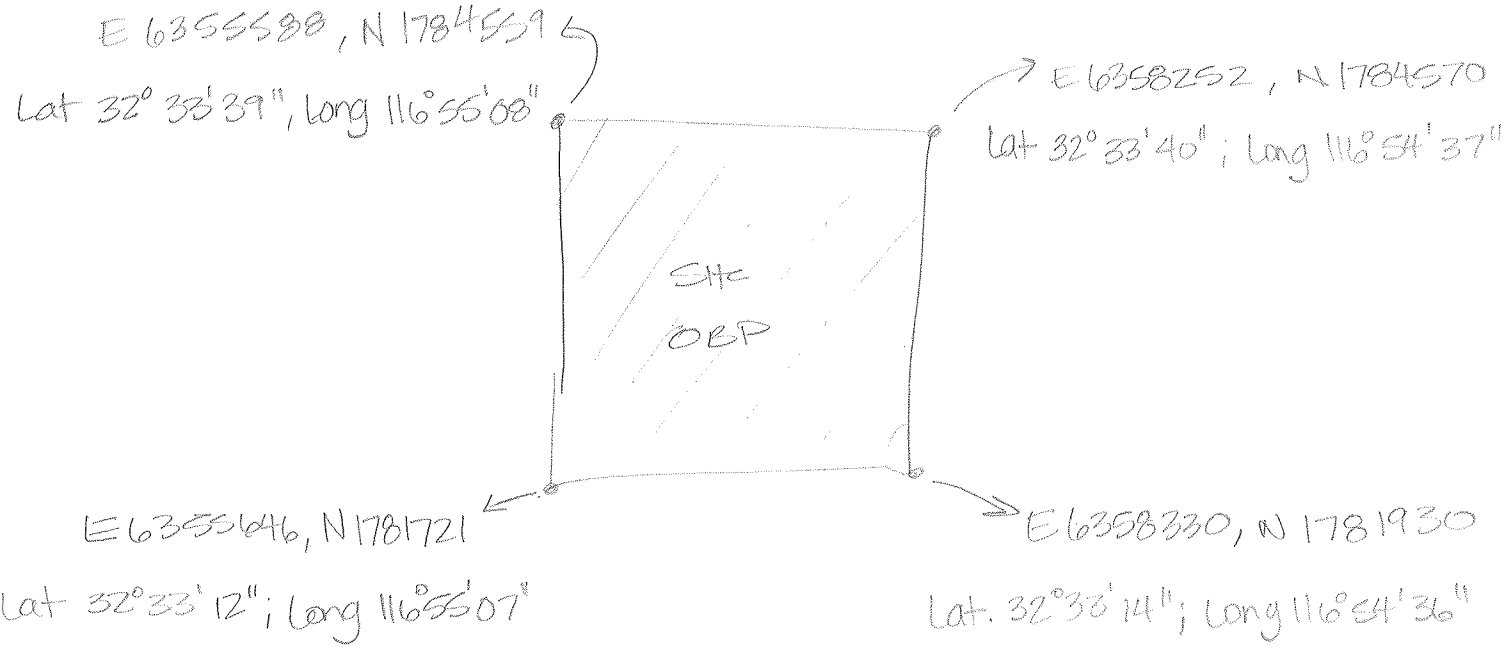
County of San Diego Hydrology Manual

Precipitation Zone Numbers (PZN)

Approximate Locations

- Lower Otay Res. Station
- Otay Business Park
- San Vicente Station
- Flynn Springs station

Otay Business Park - Site Coordinates



Lower Otay Rainfall Station Location (per CDEC website)

- Latitude: 32.609
- Longitude: 116.927

San Vicente Dam Rainfall Station Location (per CDEC website)

- Latitude: 32.913
- Longitude: 116.924

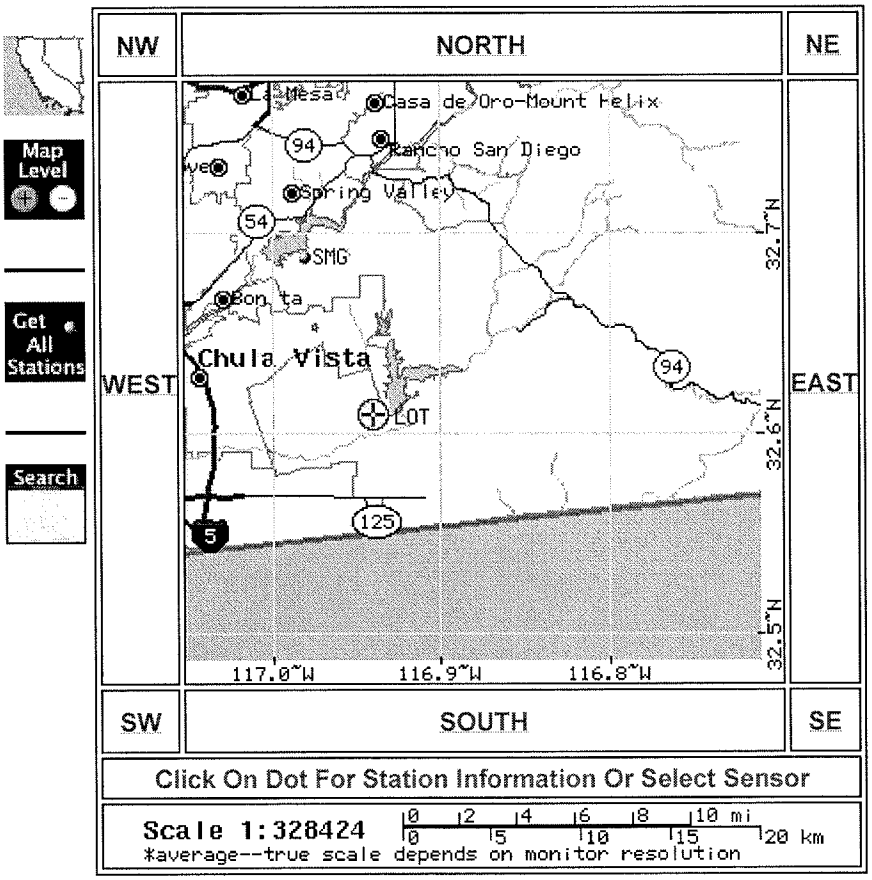
Flinn Springs Rainfall Station Location (per CDEC website)

- Latitude: 32.846
- Longitude: 116.864

Department of Water Resources
California Data Exchange Center

CDEC Station Locator - Stations near LOWER OTAY *(LOT)*

LOWER OTAY *(LOT)* is located at latitude 32.609, longitude -116.927.



Station:

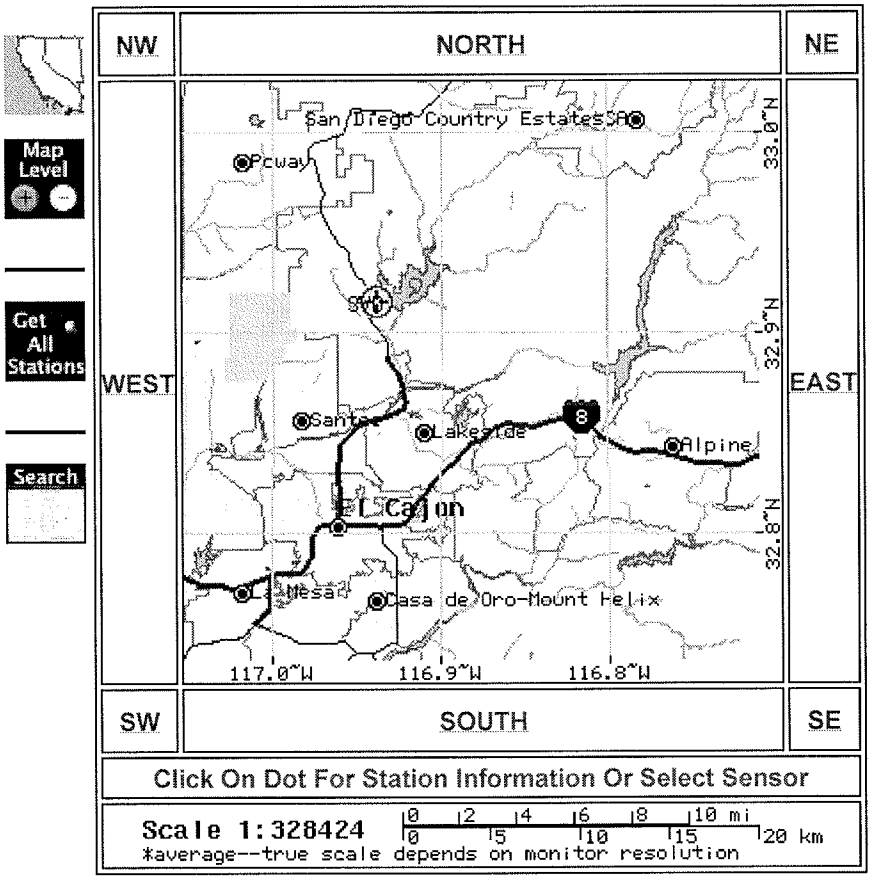
All stations in the area:

LOT - LOWER OTAY
SMG - SAN MIGUEL

Department of Water Resources
California Data Exchange Center

CDEC Station Locator - SAN VICENTE DAM *(SVD)*

Located at elevation 663 feet in the SAN DIEGO R basin. Latitude 32.913, Longitude -116.924.



Station:

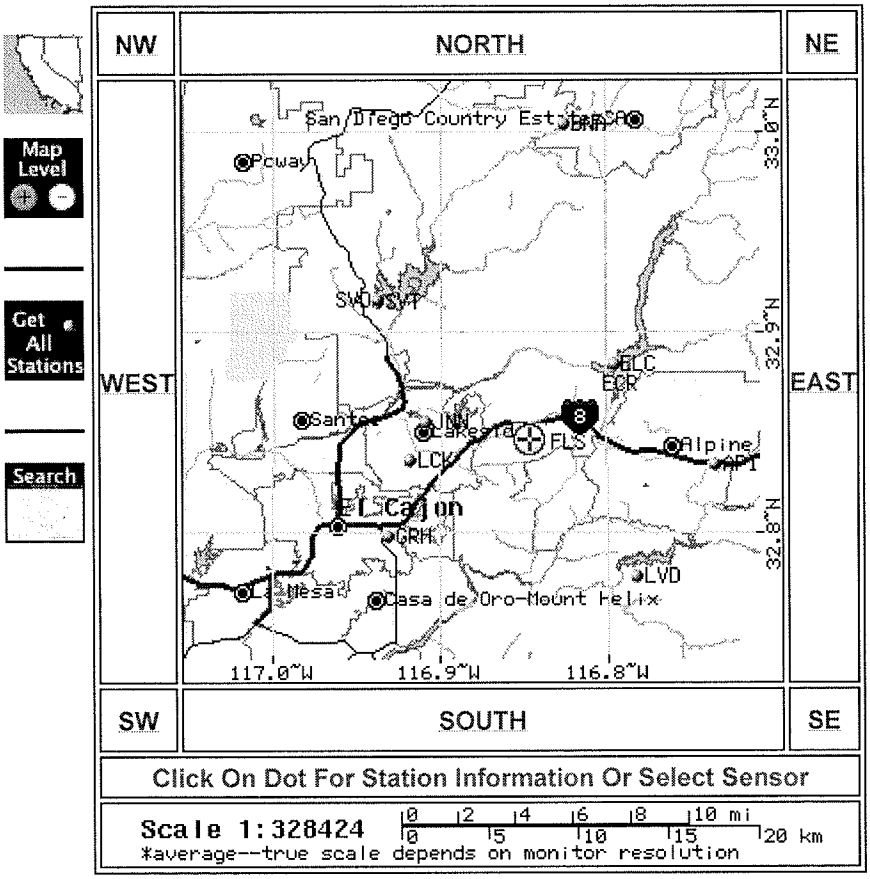
Other stations in the area:

API - ALPINE
BNA - BARONA
ECR - EL CAPITAN RESERVOIR
ELC - EL CAPITAN DAM
FLS - FLINN SPRINGS
GRH - GRANITE HILLS
JNN - LAKE JENNINGS
LCK - LOS COCHES CREEK
LVD - LOVELAND RESERVOIR
SVT - SAN VICENTE

Department of Water Resources
California Data Exchange Center

CDEC Station Locator - Stations near FLINN SPRINGS *(FLS)*

FLINN SPRINGS *(FLS)* is located at latitude 32.846, longitude -116.864.



Station:

All stations in the area:

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LCK - LOS COCHES CREEK
LVD - LOVELAND RESERVOIR
SVD - SAN VICENTE DAM
SVT - SAN VICENTE

BROWN AND CALDWELL **APPENDIX B - Technical Memorandum**

9665 Chesapeake Drive, Suite 201
San Diego, CA. 92123
Tel: 858-514-8822
Fax: 858-514-8833

Project No: 133904

San Diego County Hydromodification Management Plan (HMP)

Subject: Rainfall Station Selection Criteria

Date: January 22, 2009

To: Sara Agahi – County of San Diego

San Diego NPDES Copermittees

Hydromodification Technical Advisory Committee (TAC)

From: Eric Mosolgo – Brown and Caldwell

Copy to: Nancy Gardiner – Brown and Caldwell

This Technical Memorandum outlines standards for the selection of rainfall station data associated with Interim Hydromodification Criteria (IHC) set forth by the County of San Diego and its NPDES Copermittees. The IHC was prepared as mandated by Regional Water Quality Control Board Order R9-2007-0001 Provision D.1.g, which requires that IHC apply until the final Hydromodification Management Plan (HMP) is implemented. The purpose of the IHC is to prevent development-related changes in storm water runoff from causing, or further accelerating, stream channel erosion or other adverse impacts to beneficial stream uses.

Brown and Caldwell is currently working with the County of San Diego in the preparation of long-term hourly precipitation gauge data for multiple rainfall stations throughout San Diego County. For a given project location, the following factors should be considered in the selection of the appropriate rainfall data set.

- In most cases, the rainfall data set in closest proximity to the project site will be the appropriate choice. A rainfall station map has been posted to the *Project Clean Water* web site.
- In some cases, the rainfall data set in closest proximity to the project site may not be the most applicable data set. Such a scenario could involve a data set with an elevation significantly different from the project site. In addition to a simple elevation comparison, the project proponent may also consult with the County of San Diego's average annual precipitation isopluvial map, which is provided in the San Diego County Hydrology Manual. Review of this map could provide an initial estimate as to whether the project site is in a similar rainfall zone as compared to the rainfall stations. Generally, precipitation totals in San Diego County increase with increasing elevation.

- Where possible, rainfall data sets should be chosen so that the data set and the project location are both located in the same topographic zone (coastal, foothill, mountain) and major watershed unit (Upper San Luis Rey, Lower San Luis Rey, Upper San Diego River, Lower San Diego River, etc.).

Upon preliminary review of all available San Diego County rainfall records, Brown and Caldwell has identified 20 precipitation rain gauges for input to continuous simulation hydrologic models. The gauge locations were selected to provide adequate geographic coverage of the County. Specifically, gauges were distributed among major watersheds to provide coverage in coastal, inland valley, foothill and mountain areas of the County.

Gauge selection was further governed by minimum continuous simulation modeling requirements including the following:

- The selected precipitation gauge data set should be located near the project site to ensure that long-term rainfall records are similar to the anticipated rainfall patterns for the site. Thus, gauges were selected in proximity to areas planned for future development and redevelopment.
- Recording frequency for the gauge data set should be hourly (or more frequent).
- The gauge rainfall record should extend for the entire length of the record. Where the gauge record length is less than 35 years, then adjacent gauge records were used to extend the rainfall record to at least 35 years.
- Use of the most applicable long-term rainfall gauge data, as opposed to the scaling of rainfall patterns from Lindbergh Field, is required to account for the diverse rainfall patterns across San Diego County.

Precipitation gauges identified by Brown and Caldwell, summarized in the Table 1 below, all have recording frequencies of one hour and recording data ranges of at least 35 years.

TABLE 1 – Rainfall Station Summary

Station	Elevation	Watershed
Bonita	120	Sweetwater River
Encinitas	242	Between San Elijo Creek and San Marcos Creek ocean outfalls
Escondido	645	Escondido Creek
Fallbrook	675	San Luis Rey River (near ridge with Santa Margarita River watershed)
Fashion Valley	20	Lower San Diego River
Flinn Springs	880	San Diego River
Kearny Mesa	425	San Diego River (near ridge with San Clemente Canyon watershed)
La Mesa	420	San Diego River (near ridge with Chollas Creek watershed)
Lake Cuyamaca	4,590	Upper San Diego River
Lake Heneshaw	2,990	Upper San Luis Rey River
Lake Wohlford	1,490	Upper Escondido Creek
Lindbergh Field	Near Sea Level	Coastal – San Diego Bay
Lower Otay Reservoir	491	Otay River
Morena Dam	3,075	Upper Tijuana River
Oceanside	30	San Luis Rey River

Poway	440	Los Penasquitos Canyon
Ramona	1,450	Upper San Dieguito River
San Onofre	162	North County Coastal – Pacific Ocean
San Vicente Reservoir	663	San Diego River
Santee	300	San Diego River

Sources for data used in the preparation of rainfall gauges include the following:

- ALERT rainfall gauge information from the County of San Diego
- Historical (pre-1982) rainfall station information from the County of San Diego
- NOAA / National Climatic Data Center
- Western Regional Climate Center
- California Irrigation Management Information System
- California Data Exchange Center
- California Department of Forestry

Prior to the commencement of hydromodification flow control modeling to meet Interim Hydromodification Criteria for a project site, the project proponent should take the following steps to ensure use of the appropriate precipitation gauge data.

- For projects in the unincorporated areas of San Diego County, the project proponent should contact the appropriate Department of Public Works (DPW) Project Manager
- For projects located in other jurisdictions within San Diego County, the project proponent should contact the jurisdiction's NPDES coordinator.

Brown and Caldwell has provided rainfall gauge information in a WDM format compatible with the HSPF hydrologic model. Upon request, the rainfall data may also be provided in formats compatible with HEC-HMS. This prepared rainfall station information is available on the *Project Clean Water* web site.

Upon completion of the Hydromodification Management Plan and implementation of final hydromodification criteria, the hydromodification flow control sizing tool being developed by Brown and Caldwell will automate the rainfall gauge selection process. The information in this Technical Memorandum is subject to revision pending final review by the County of San Diego, NPDES Co-Permittees, and the Technical Advisory Committee.

San Onofre
Fallbrook
Sandia Creek Rd
Rainbow Camp
Oat Flats
Pala 3SW
Couser Canyon
Bonsall
Cole Grade Road
Rincon Springs
Palomar Observ.
Birch Hill
La Jolla Amago
Lake Henshaw
Coyote Creek
Borrego Palm
Borrego CRS
Ocotillo Wells
Ranchita
Oceanside
Loma Alta
Buena Vista
Deer Springs
Valley Center
Skyline Ranch
Agua Hedionda
Carlsbad
San Marcos CRS
Lake Wohlford
Escondido
Harmony Grove
San Marcos
Lake Hodges
El Camino del Norte
Encinitas
Sutherland Res
Volcan Mountain
Santa Ysabel
San Felipe
Julian
Witch Creek FS
Ramona
San Elijo Lagoon
Rancho Bernardo
Mt. Woodson
Barona
Pine Hills FS
Solana Beach
SD Country Estates
Lake Cuyamaca
Ranchita Margarita
Agua Caliente
Poway
Miramar Lake
San Vicente Res
El Capitan Res
Echo Dell
Cactus County Park
Flinn Springs
Viejas Mountain
Descanso R.S.
Mount Laguna
Kearny Mesa
Santee
Los Coches Cr
Harbison Canyon
Lake Murray
Granite Hills
Fashion Valley
La Mesa
Lindbergh Field
Roads Div I
Bonita Road
Bonita
Plaza Bonita
Thousand Trails
Barrett Dam
Morena Lake
Tierra del Sol
Campo
Lower Otay Res
Dulzura Summit
Potrero Park
Marron Valley
Puente San Jose II
San Ysidro
Rio Alamar @ Toll Bridge
Loma Tova
Rancho Tecate
Rodriguez Reservoir
MEXICO

5
15
805
163
8

0 4 8
SCALE IN MILES

LEGEND
RIVERS/CREEKS
WATERSHEDS
PRECIPITATION
Bonita● STATION TO BE INCLUDED IN HYDROMODIFICATION RAINFALL DATA SET
Bonsall▲ OTHER ALERT STATION

FIGURE 1

RAINFALL STATION MAP

PROJECT LOCATION	DATE	PROJECT NUMBER
SAN DIEGO COUNTY, CALIFORNIA	OCT 2008	133904

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

Kimley-Horn
and Associates, Inc.

Appendix B ~ SDHM Output

San Diego Hydrology Model
PROJECT REPORT

Project Name: OtayBusinessPark
Site Address:
City :
Report Date : 3/17/2009
Gage :
Data Start : 1973/01/05
Data End : 2001/01/29
Precip Scale: 1.00
SDHM Version:

PREDEVELOPED LAND USE

Name : East Basin
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C D,Grass,Flat(0-5%)	50.61
C D,Dirt, Flat(0-5%)	21.69

Impervious Land Use	Acres

Element Flows To:

Surface	Interflow	Groundwater

Name : Industrial Parcels
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C D,Grass,Flat(0-5%)	17.54

Impervious Land Use	Acres		
Driveways,Flat(0-5%)	20.48	,Flat(0-5%)	20.48

Element Flows To:

Surface	Interflow	Groundwater
East Detention Basin,	East Detention Basin,	

Name : East Detention Basin
Bottom Length: 137.833585698882ft.
Bottom Width: 137.833585698882ft.
Depth : 18ft.
Volume at riser head : 11.8690ft.
Side slope 1: 2 To 1
Side slope 2: 2 To 1
Side slope 3: 2 To 1
Side slope 4: 2 To 1
Discharge Structure
Riser Height: 17 ft.

Riser Diameter: 48 in.
NotchType : Rectangular
Notch Width : 3.969 ft.
Notch Height: 0.415 ft.
Orifice 1 Diameter: 4.1888 in. **Elevation:** 0 ft.

Element Flows To:
Outlet 1 **Outlet 2**

Pond Hydraulic Table

Stage(ft)	Area(acr)	Volume(acr-ft)	Dschrg(cfs)	Infilt(cfs)
0.000	0.436	0.000	0.000	0.000
0.200	0.441	0.088	0.206	0.000
0.400	0.446	0.176	0.291	0.000
0.600	0.451	0.266	0.357	0.000
0.800	0.457	0.357	0.412	0.000
1.000	0.462	0.449	0.461	0.000
1.200	0.467	0.542	0.505	0.000
1.400	0.472	0.636	0.545	0.000
1.600	0.478	0.731	0.583	0.000
1.800	0.483	0.827	0.618	0.000
2.000	0.488	0.924	0.652	0.000
2.200	0.494	1.022	0.684	0.000
2.400	0.499	1.121	0.714	0.000
2.600	0.504	1.222	0.743	0.000
2.800	0.510	1.323	0.771	0.000
3.000	0.515	1.426	0.798	0.000
3.200	0.521	1.529	0.824	0.000
3.400	0.526	1.634	0.850	0.000
3.600	0.532	1.740	0.874	0.000
3.800	0.538	1.847	0.898	0.000
4.000	0.543	1.955	0.922	0.000
4.200	0.549	2.064	0.944	0.000
4.400	0.555	2.174	0.967	0.000
4.600	0.560	2.286	0.988	0.000
4.800	0.566	2.399	1.010	0.000
5.000	0.572	2.512	1.030	0.000
5.200	0.578	2.627	1.051	0.000
5.400	0.584	2.744	1.071	0.000
5.600	0.589	2.861	1.091	0.000
5.800	0.595	2.979	1.110	0.000
6.000	0.601	3.099	1.129	0.000
6.200	0.607	3.220	1.147	0.000
6.400	0.613	3.342	1.166	0.000
6.600	0.619	3.465	1.184	0.000
6.800	0.625	3.589	1.202	0.000
7.000	0.631	3.715	1.219	0.000
7.200	0.637	3.842	1.237	0.000
7.400	0.644	3.970	1.254	0.000
7.600	0.650	4.099	1.270	0.000
7.800	0.656	4.230	1.287	0.000
8.000	0.662	4.362	1.303	0.000
8.200	0.668	4.495	1.320	0.000
8.400	0.675	4.629	1.336	0.000
8.600	0.681	4.765	1.351	0.000
8.800	0.687	4.902	1.367	0.000
9.000	0.694	5.040	1.382	0.000
9.200	0.700	5.179	1.398	0.000
9.400	0.707	5.320	1.413	0.000
9.600	0.713	5.462	1.428	0.000
9.800	0.719	5.605	1.443	0.000
10.00	0.726	5.750	1.457	0.000
10.20	0.733	5.895	1.472	0.000
10.40	0.739	6.043	1.486	0.000
10.60	0.746	6.191	1.500	0.000
10.80	0.752	6.341	1.514	0.000
11.00	0.759	6.492	1.528	0.000
11.20	0.766	6.644	1.542	0.000

11.40	0.772	6.798	1.556	0.000
11.60	0.779	6.953	1.570	0.000
11.80	0.786	7.110	1.583	0.000
12.00	0.793	7.268	1.596	0.000
12.20	0.800	7.427	1.610	0.000
12.40	0.807	7.588	1.623	0.000
12.60	0.813	7.750	1.636	0.000
12.80	0.820	7.913	1.649	0.000
13.00	0.827	8.078	1.662	0.000
13.20	0.834	8.244	1.674	0.000
13.40	0.841	8.412	1.687	0.000
13.60	0.848	8.580	1.699	0.000
13.80	0.855	8.751	1.712	0.000
14.00	0.863	8.923	1.724	0.000
14.20	0.870	9.096	1.737	0.000
14.40	0.877	9.271	1.749	0.000
14.60	0.884	9.447	1.761	0.000
14.80	0.891	9.624	1.773	0.000
15.00	0.898	9.803	1.785	0.000
15.20	0.906	9.984	1.797	0.000
15.40	0.913	10.17	1.808	0.000
15.60	0.920	10.35	1.820	0.000
15.80	0.928	10.53	1.832	0.000
16.00	0.935	10.72	1.843	0.000
16.20	0.943	10.91	1.855	0.000
16.40	0.950	11.10	1.866	0.000
16.60	0.958	11.29	1.902	0.000
16.80	0.965	11.48	3.149	0.000
17.00	0.973	11.67	5.139	0.000
17.20	0.980	11.87	8.635	0.000
17.40	0.988	12.07	15.02	0.000
17.60	0.995	12.26	23.28	0.000
17.80	1.003	12.46	33.06	0.000
18.00	1.011	12.67	44.15	0.000
18.20	1.019	12.87	56.41	0.000

Name : West Basin
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C D,Grass,Flat(0-5%)	54.32
C D,Dirt, Flat(0-5%)	23.28

Impervious Land Use	Acres

Element Flows To:

Surface	Interflow	Groundwater

Name : Roads
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C D,Grass,Flat(0-5%)	.64

Impervious Land Use	Acres
Roads,Flat(0-5%)	12.16

Element Flows To:

Surface	Interflow	Groundwater
East Detention Basin,	East Detention Basin,	

Name : Roads
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C D,Grass,Flat(0-5%)	1.34

Impervious Land Use	Acres
Roads,Flat(0-5%)	25.37

Element Flows To:

Surface	Interflow	Groundwater
West Detention Basin,	West Detention Basin,	

Name : Industrial Parcels
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C D,Grass,Flat(0-5%)	14.22

Impervious Land Use	Acres		
Roof Area	16.59	,Flat(0-5%)	16.59

Element Flows To:

Surface	Interflow	Groundwater
West Detention Basin,	West Detention Basin,	

Name : West Detention Basin
Bottom Length: 356.003332893216ft.
Bottom Width: 356.003332893216ft.
Depth : 6ft.
Volume at riser head : 15.3801ft.
Side slope 1: 2 To 1
Side slope 2: 2 To 1
Side slope 3: 2 To 1
Side slope 4: 2 To 1
Discharge Structure
Riser Height: 5 ft.
Riser Diameter: 48 in.
NotchType : Rectangular
Notch Width : 4.000 ft.
Notch Height: 0.122 ft.
Orifice 1 Diameter: 5.8701 in. Elevation: 0 ft.

Element Flows To:

Outlet 1	Outlet 2

Pond Hydraulic Table

Stage(ft)	Area(acr)	Volume(acr-ft)	Dschrg(cfs)	Infilt(cfs)
0.000	2.910	0.000	0.000	0.000
0.067	2.914	0.194	0.234	0.000
0.133	2.918	0.389	0.330	0.000
0.200	2.923	0.583	0.405	0.000
0.267	2.927	0.778	0.467	0.000
0.333	2.931	0.973	0.523	0.000
0.400	2.936	1.169	0.572	0.000
0.467	2.940	1.365	0.618	0.000
0.533	2.944	1.561	0.661	0.000
0.600	2.949	1.758	0.701	0.000
0.667	2.953	1.954	0.739	0.000
0.733	2.958	2.151	0.775	0.000
0.800	2.962	2.349	0.809	0.000
0.867	2.966	2.546	0.843	0.000
0.933	2.971	2.744	0.874	0.000
1.000	2.975	2.942	0.905	0.000
1.067	2.980	3.141	0.935	0.000
1.133	2.984	3.340	0.963	0.000
1.200	2.988	3.539	0.991	0.000
1.267	2.993	3.738	1.019	0.000
1.333	2.997	3.938	1.045	0.000
1.400	3.002	4.138	1.071	0.000
1.467	3.006	4.338	1.096	0.000
1.533	3.011	4.539	1.121	0.000
1.600	3.015	4.739	1.145	0.000
1.667	3.020	4.941	1.168	0.000
1.733	3.024	5.142	1.191	0.000
1.800	3.028	5.344	1.214	0.000
1.867	3.033	5.546	1.236	0.000
1.933	3.037	5.748	1.258	0.000
2.000	3.042	5.951	1.280	0.000
2.067	3.046	6.154	1.301	0.000
2.133	3.051	6.357	1.322	0.000
2.200	3.055	6.560	1.342	0.000
2.267	3.060	6.764	1.363	0.000
2.333	3.064	6.968	1.382	0.000
2.400	3.069	7.173	1.402	0.000
2.467	3.073	7.378	1.421	0.000
2.533	3.078	7.583	1.440	0.000
2.600	3.082	7.788	1.459	0.000
2.667	3.086	7.993	1.478	0.000
2.733	3.091	8.199	1.496	0.000
2.800	3.095	8.406	1.514	0.000
2.867	3.100	8.612	1.532	0.000
2.933	3.104	8.819	1.550	0.000
3.000	3.109	9.026	1.568	0.000
3.067	3.113	9.233	1.585	0.000
3.133	3.118	9.441	1.602	0.000
3.200	3.122	9.649	1.619	0.000
3.267	3.127	9.858	1.636	0.000
3.333	3.132	10.07	1.652	0.000
3.400	3.136	10.28	1.669	0.000
3.467	3.141	10.48	1.685	0.000
3.533	3.145	10.69	1.701	0.000
3.600	3.150	10.90	1.717	0.000
3.667	3.154	11.11	1.733	0.000
3.733	3.159	11.32	1.749	0.000
3.800	3.163	11.53	1.764	0.000
3.867	3.168	11.75	1.780	0.000
3.933	3.172	11.96	1.795	0.000
4.000	3.177	12.17	1.810	0.000
4.067	3.181	12.38	1.825	0.000
4.133	3.186	12.59	1.840	0.000
4.200	3.191	12.81	1.855	0.000
4.267	3.195	13.02	1.869	0.000
4.333	3.200	13.23	1.884	0.000
4.400	3.204	13.45	1.898	0.000
4.467	3.209	13.66	1.913	0.000
4.533	3.213	13.87	1.927	0.000
4.600	3.218	14.09	1.941	0.000

4.667	3.223	14.30	1.955	0.000
4.733	3.227	14.52	1.969	0.000
4.800	3.232	14.73	1.983	0.000
4.867	3.236	14.95	1.996	0.000
4.933	3.241	15.16	2.182	0.000
5.000	3.246	15.38	2.579	0.000
5.067	3.250	15.60	3.263	0.000
5.133	3.255	15.81	4.502	0.000
5.200	3.259	16.03	6.103	0.000
5.267	3.264	16.25	7.996	0.000
5.333	3.269	16.47	10.14	0.000
5.400	3.273	16.68	12.51	0.000
5.467	3.278	16.90	15.09	0.000
5.533	3.283	17.12	17.86	0.000
5.600	3.287	17.34	20.80	0.000
5.667	3.292	17.56	23.91	0.000
5.733	3.296	17.78	27.19	0.000
5.800	3.301	18.00	30.61	0.000
5.867	3.306	18.22	34.18	0.000
5.933	3.310	18.44	37.89	0.000
6.000	3.315	18.66	41.73	0.000
6.067	3.320	18.88	45.70	0.000

MITIGATED LAND USE

ANALYSIS RESULTS

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.024297
5 year	6.409513
10 year	16.012
25 year	20.880059

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.367217
5 year	0.484245
10 year	1.079755
25 year	13.285826

Yearly Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1975	0.017	0.375
1976	0.015	0.347
1977	0.029	0.484
1978	0.020	0.374
1979	15.968	0.484
1980	1.408	0.355
1981	2.670	0.440
1982	0.014	0.336
1983	0.093	0.371
1984	8.994	0.531
1985	0.000	0.175
1986	2.249	0.427
1987	5.240	0.409
1988	0.010	0.288
1989	5.126	0.329
1990	0.007	0.270
1991	0.011	0.354
1992	6.154	0.506
1993	7.634	0.420
1994	16.603	8.484
1995	0.010	0.240
1996	1.322	0.398
1997	0.010	0.266
1998	0.297	0.413

1999	22.509	15.115
2000	0.016	0.297
2001	0.005	0.341
2002	0.010	0.364

Ranked Yearly Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	22.5093	15.1152
2	16.6033	8.4837
3	15.9682	0.5313
4	8.9942	0.5063
5	7.6339	0.4843
6	6.1544	0.4842
7	5.2396	0.4395
8	5.1257	0.4273
9	2.6705	0.4202
10	2.2488	0.4129
11	1.4076	0.4086
12	1.3216	0.3979
13	0.2975	0.3747
14	0.0934	0.3735
15	0.0293	0.3708
16	0.0196	0.3639
17	0.0173	0.3553
18	0.0158	0.3535
19	0.0150	0.3473
20	0.0135	0.3415
21	0.0113	0.3361
22	0.0103	0.3290
23	0.0102	0.2972
24	0.0096	0.2882
25	0.0095	0.2703
26	0.0069	0.2658
27	0.0050	0.2402
28	0.0001	0.1751

POC #1
The Facility PASSED

The Facility PASSED.

Flow(CFS)	Predev	Dev	Percentage	Pass/Fail
1.2819	74	81	109	Pass
1.4307	68	72	105	Pass
1.5795	63	61	96	Pass
1.7283	58	57	98	Pass
1.8771	56	53	94	Pass
2.0258	51	50	98	Pass
2.1746	48	46	95	Pass
2.3234	42	42	100	Pass
2.4722	40	40	100	Pass
2.6210	38	37	97	Pass
2.7698	36	36	100	Pass
2.9186	36	34	94	Pass
3.0674	36	30	83	Pass
3.2162	33	27	81	Pass
3.3649	33	26	78	Pass
3.5137	33	24	72	Pass
3.6625	32	22	68	Pass
3.8113	31	21	67	Pass
3.9601	28	18	64	Pass
4.1089	26	17	65	Pass
4.2577	26	16	61	Pass
4.4065	25	13	52	Pass
4.5553	25	11	44	Pass
4.7040	23	10	43	Pass
4.8528	23	10	43	Pass
5.0016	22	10	45	Pass
5.1504	20	10	50	Pass

5.2992	19	10	52	Pass
5.4480	19	10	52	Pass
5.5968	18	9	50	Pass
5.7456	17	8	47	Pass
5.8944	17	8	47	Pass
6.0431	17	8	47	Pass
6.1919	16	8	50	Pass
6.3407	16	7	43	Pass
6.4895	16	7	43	Pass
6.6383	16	7	43	Pass
6.7871	16	7	43	Pass
6.9359	15	7	46	Pass
7.0847	14	6	42	Pass
7.2335	14	6	42	Pass
7.3822	13	6	46	Pass
7.5310	12	6	50	Pass
7.6798	11	5	45	Pass
7.8286	11	5	45	Pass
7.9774	11	5	45	Pass
8.1262	11	5	45	Pass
8.2750	11	5	45	Pass
8.4238	11	5	45	Pass
8.5726	10	4	40	Pass
8.7213	10	4	40	Pass
8.8701	9	4	44	Pass
9.0189	7	4	57	Pass
9.1677	7	4	57	Pass
9.3165	7	4	57	Pass
9.4653	7	4	57	Pass
9.6141	7	4	57	Pass
9.7629	7	4	57	Pass
9.9117	7	4	57	Pass
10.0604	6	4	66	Pass
10.2092	6	4	66	Pass
10.3580	6	4	66	Pass
10.5068	6	4	66	Pass
10.6556	6	4	66	Pass
10.8044	6	3	50	Pass
10.9532	6	3	50	Pass
11.1020	6	3	50	Pass
11.2508	6	3	50	Pass
11.3995	6	3	50	Pass
11.5483	6	3	50	Pass
11.6971	6	3	50	Pass
11.8459	6	3	50	Pass
11.9947	6	3	50	Pass
12.1435	6	3	50	Pass
12.2923	6	3	50	Pass
12.4411	5	2	40	Pass
12.5899	5	2	40	Pass
12.7386	5	2	40	Pass
12.8874	5	2	40	Pass
13.0362	5	2	40	Pass
13.1850	5	2	40	Pass
13.3338	5	1	20	Pass
13.4826	5	1	20	Pass
13.6314	5	1	20	Pass
13.7802	5	1	20	Pass
13.9290	5	1	20	Pass
14.0777	5	1	20	Pass
14.2265	5	1	20	Pass
14.3753	5	1	20	Pass
14.5241	5	1	20	Pass
14.6729	5	1	20	Pass
14.8217	5	1	20	Pass
14.9705	4	1	25	Pass
15.1193	4	1	25	Pass
15.2681	4	0	0	Pass
15.4168	4	0	0	Pass
15.5656	4	0	0	Pass
15.7144	4	0	0	Pass
15.8632	4	0	0	Pass

16.0120	3	0	0	Pass

The Development Has an increase in flow durations for more than 20% of the flows for the range of the duration analysis.

Drawdown Time Results

Pond: East Detention Basin

Days	Stage(feet)	Percent of Total Run Time
1	2.821	3.0750
2	6.346	1.0416
3	10.29	0.3653
4	14.31	0.0711
5	18.00	0.0000

Maximum Stage: 17.50
Drawdown Time: 04 08:41:30

Pond: West Detention Basin

Days	Stage(feet)	Percent of Total Run Time
1	0.500	4.3328
2	1.049	2.0004
3	1.770	0.9099
4	2.653	0.3856
5	3.685	0.1077

Maximum Stage: 5.238
Drawdown Time: 05 00:00:10

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	Flow(cfs)
2 year	0.042948
5 year	12.171969
10 year	19.93589
25 year	36.818038

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	Flow(cfs)
2 year	1.426138
5 year	4.691518
10 year	10.515341
25 year	31.588759

Yearly Peaks for Predeveloped and Mitigated. POC #2

Year	Predeveloped	Mitigated
1975	0.027	1.600
1976	1.137	1.614
1977	0.600	1.971
1978	0.098	1.669
1979	12.729	3.664
1980	23.658	10.288
1981	41.832	38.446
1982	0.038	1.320
1983	0.006	1.265
1984	13.707	13.589
1985	0.013	1.050
1986	0.145	1.296
1987	12.056	1.760
1988	0.043	1.315
1989	0.185	1.341
1990	0.008	0.960
1991	0.000	0.819
1992	0.026	5.558
1993	0.822	1.459
1994	19.660	6.728
1995	0.043	1.217
1996	10.922	4.511
1997	0.026	1.395
1998	0.030	1.468
1999	11.048	1.705
2000	0.012	0.994
2001	0.000	0.574
2002	0.010	1.352

Ranked Yearly Peaks for Predeveloped and Mitigated. POC #2

Rank	Predeveloped	Mitigated
1	41.8315	38.4460
2	23.6577	13.5885
3	19.6602	10.2877

4	13.7073	6.7276
5	12.7291	5.5581
6	12.0559	4.5110
7	11.0480	3.6636
8	10.9215	1.9712
9	1.1365	1.7601
10	0.8222	1.7051
11	0.5999	1.6689
12	0.1848	1.6140
13	0.1445	1.5999
14	0.0984	1.4677
15	0.0434	1.4594
16	0.0425	1.3951
17	0.0384	1.3520
18	0.0300	1.3413
19	0.0269	1.3205
20	0.0264	1.3152
21	0.0260	1.2957
22	0.0131	1.2652
23	0.0125	1.2169
24	0.0097	1.0502
25	0.0084	0.9935
26	0.0060	0.9603
27	0.0004	0.8194
28	0.0001	0.5741

POC #2

The Facility PASSED

The Facility PASSED.

Flow(CFS)	Predev	Dev	Percentage	Pass/Fail
2.4344	113	113	100	Pass
2.6112	104	100	96	Pass
2.7880	102	88	86	Pass
2.9647	97	79	81	Pass
3.1415	92	70	76	Pass
3.3183	86	67	77	Pass
3.4951	81	60	74	Pass
3.6719	78	55	70	Pass
3.8487	75	50	66	Pass
4.0254	71	46	64	Pass
4.2022	68	44	64	Pass
4.3790	66	42	63	Pass
4.5558	64	37	57	Pass
4.7326	61	36	59	Pass
4.9094	59	34	57	Pass
5.0861	56	33	58	Pass
5.2629	55	29	52	Pass
5.4397	52	27	51	Pass
5.6165	51	24	47	Pass
5.7933	49	22	44	Pass
5.9700	48	19	39	Pass
6.1468	44	17	38	Pass
6.3236	43	17	39	Pass
6.5004	39	17	43	Pass
6.6772	38	14	36	Pass
6.8540	38	13	34	Pass
7.0307	37	13	35	Pass
7.2075	34	13	38	Pass
7.3843	33	13	39	Pass
7.5611	31	12	38	Pass
7.7379	29	12	41	Pass
7.9147	28	12	42	Pass
8.0914	26	10	38	Pass
8.2682	25	10	40	Pass
8.4450	24	10	41	Pass
8.6218	24	8	33	Pass
8.7986	24	8	33	Pass
8.9754	24	7	29	Pass
9.1521	23	7	30	Pass
9.3289	23	7	30	Pass
9.5057	22	7	31	Pass
9.6825	21	7	33	Pass
9.8593	21	5	23	Pass
10.0361	20	5	25	Pass

10.2128	20	5	25	Pass
10.3896	19	4	21	Pass
10.5664	18	4	22	Pass
10.7432	17	4	23	Pass
10.9200	16	4	25	Pass
11.0968	13	4	30	Pass
11.2735	13	4	30	Pass
11.4503	13	4	30	Pass
11.6271	13	4	30	Pass
11.8039	13	4	30	Pass
11.9807	13	4	30	Pass
12.1574	12	4	33	Pass
12.3342	12	4	33	Pass
12.5110	12	4	33	Pass
12.6878	12	4	33	Pass
12.8646	11	4	36	Pass
13.0414	11	4	36	Pass
13.2181	11	4	36	Pass
13.3949	10	4	40	Pass
13.5717	8	4	50	Pass
13.7485	7	3	42	Pass
13.9253	7	3	42	Pass
14.1021	7	3	42	Pass
14.2788	7	3	42	Pass
14.4556	6	3	50	Pass
14.6324	5	3	60	Pass
14.8092	5	3	60	Pass
14.9860	5	3	60	Pass
15.1628	5	3	60	Pass
15.3395	5	3	60	Pass
15.5163	5	3	60	Pass
15.6931	4	3	75	Pass
15.8699	4	3	75	Pass
16.0467	4	3	75	Pass
16.2235	4	3	75	Pass
16.4002	4	3	75	Pass
16.5770	4	3	75	Pass
16.7538	4	3	75	Pass
16.9306	4	3	75	Pass
17.1074	4	3	75	Pass
17.2841	4	3	75	Pass
17.4609	4	3	75	Pass
17.6377	4	3	75	Pass
17.8145	4	3	75	Pass
17.9913	4	3	75	Pass
18.1681	4	3	75	Pass
18.3448	4	3	75	Pass
18.5216	4	3	75	Pass
18.6984	4	3	75	Pass
18.8752	4	3	75	Pass
19.0520	4	3	75	Pass
19.2288	4	3	75	Pass
19.4055	4	3	75	Pass
19.5823	4	3	75	Pass
19.7591	3	3	100	Pass
19.9359	3	3	100	Pass

Drawdown Time Results
Pond: East Detention Basin

Days	Stage(feet)	Percent of Total Run Time
1	2.821	3.0750
2	6.346	1.0416
3	10.29	0.3653
4	14.31	0.0711
5	18.00	0.0000

Maximum Stage: 17.50
Drawdown Time: 04 08:41:30

Pond: West Detention Basin
Days Stage(feet) Percent of Total Run Time

1	0.500	4.3328
2	1.049	2.0004
3	1.770	0.9099
4	2.653	0.3856
5	3.685	0.1077

Maximum Stage: 5.238
Drawdown Time: 05 00:00:10

Land Use Report For OtayBusinessPark Developed Mitigated

Pervious Land Areas

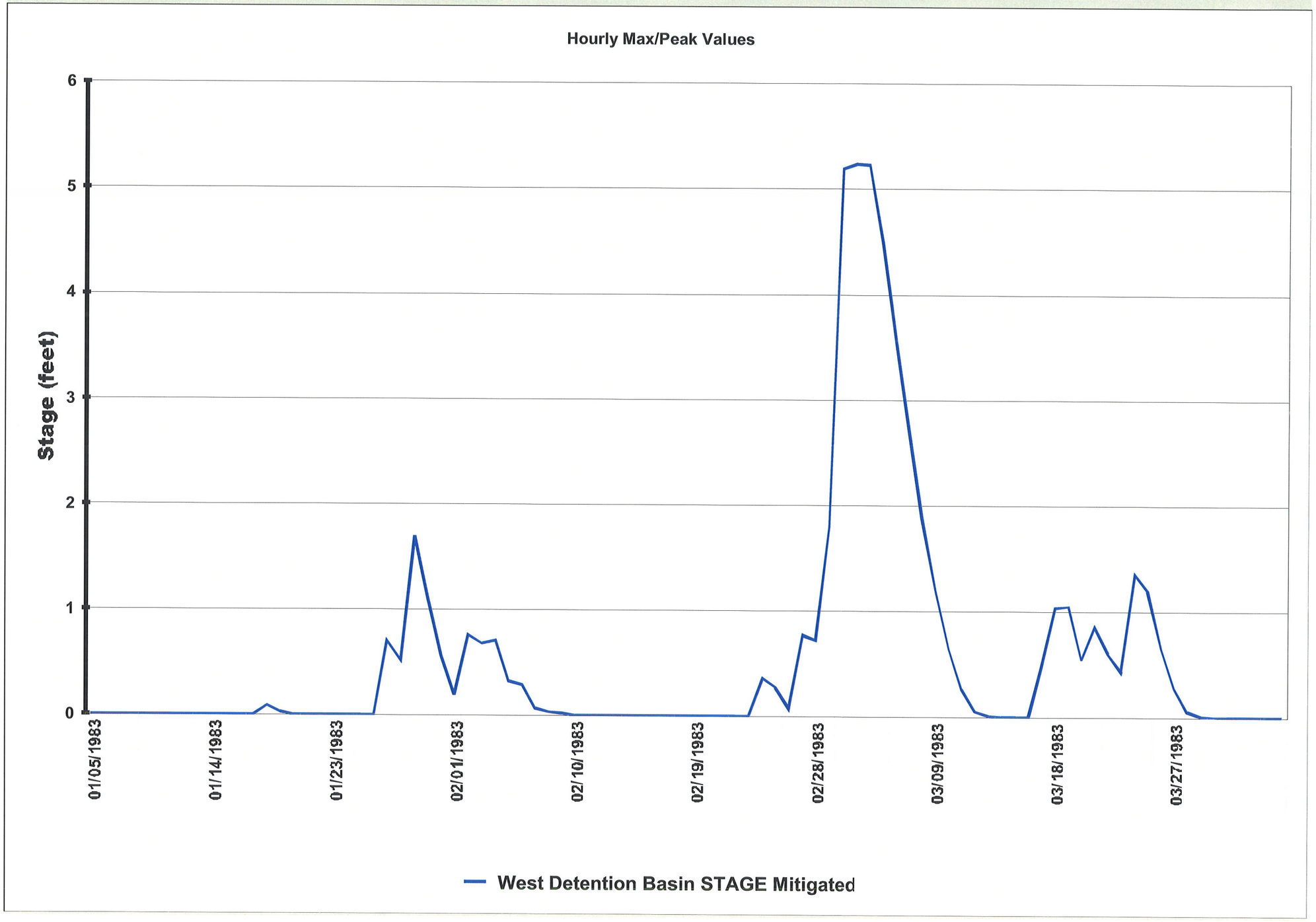
	Industrial	Roads	Roads	Industrial
C D-Grass-Flat(0-5%)	17.54	.64	1.34	14.22

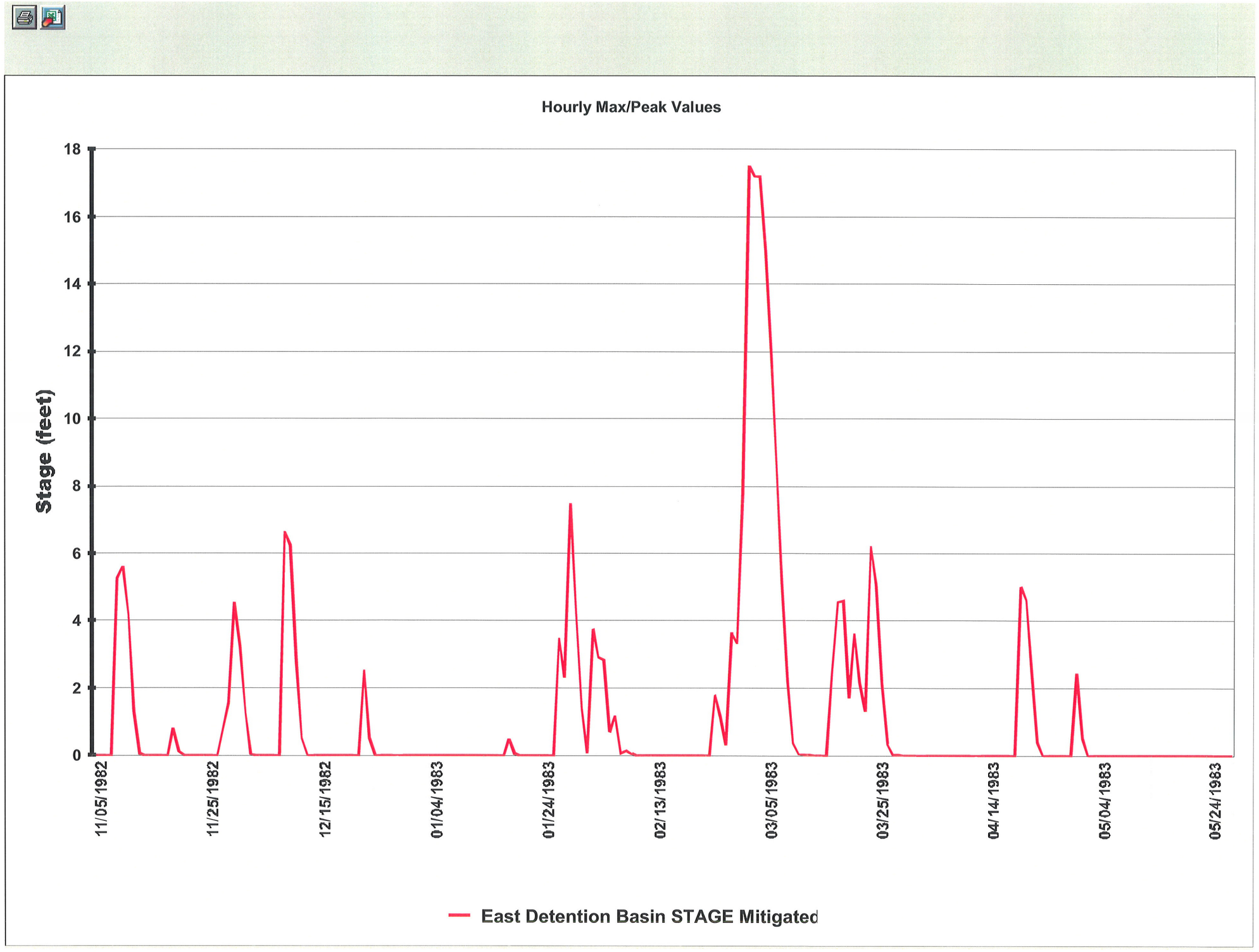
Impervious Land Areas

	Industrial	Roads	Roads	Industrial
Roads-Flat(0-5%)		12.16	25.37	
Roof Area				16.59
Driveways-Flat(0-5%)	20.48			
Parking-Flat(0-5%)	20.48			16.59

Drawdown Analysis

Time (days)	West Basin		East Basin	
	Day	Stage (Ft)	Day	Stage (Ft)
0	2/23/1983	0	2/23/1983	0
1	2/24/1983	0.359745	2/24/1983	1.80661
2	2/25/1983	0.270357	2/25/1983	1.18497
3	2/26/1983	0.069237	2/26/1983	0.305339
4	2/27/1983	0.768384	2/27/1983	3.65871
5	2/28/1983	0.71763	2/28/1983	3.3308
6	3/1/1983	1.80086	3/1/1983	7.80985
7	3/2/1983	5.19269	3/2/1983	17.5029
8	3/3/1983	5.23837	3/3/1983	17.2036
9	3/4/1983	5.23227	3/4/1983	17.1814
10	3/5/1983	4.48965	3/5/1983	14.9859
11	3/6/1983	3.58211	3/6/1983	11.8664
12	3/7/1983	2.71768	3/7/1983	8.58906
13	3/8/1983	1.88842	3/8/1983	5.13753
14	3/9/1983	1.19235	3/9/1983	2.19868
15	3/10/1983	0.64587	3/10/1983	0.379487
16	3/11/1983	0.261766	3/11/1983	0.036371
17	3/12/1983	0.049998	3/12/1983	0.022566
18	3/13/1983	0.006703	3/13/1983	0.015475
19	3/14/1983	0.001565	3/14/1983	0.010534
20	3/15/1983	0.000277	3/15/1983	0.007074
21	3/16/1983	0.000121	3/16/1983	0.004652


Hourly Max/Peak Values
Stage (feet)
6
5
4
3
2
1
0
01/05/1983
01/14/1983
01/23/1983
02/01/1983
02/10/1983
02/19/1983
02/28/1983
03/09/1983
03/18/1983
03/27/1983
West Detention Basin STAGE Mitigated


Hourly Max/Peak Values
Stage (feet)
18
16
14
12
10
8
6
4
2
0
11/05/1982
11/25/1982
12/15/1982
01/04/1983
01/24/1983
02/13/1983
03/05/1983
03/25/1983
04/14/1983
05/04/1983
05/24/1983
East Detention Basin STAGE Mitigated

Kimley-Horn
and Associates, Inc.

Appendix C ~ Vector Control Plan

February 10, 2010

Vector Control Plan
for
Otay Business Park

Project Description

This vector control plan references the County of San Diego Tract Number TM 5505 aka *Otay Business Park.* The *Otay Business Park* project involves the development of 161 acres in the East Otay Mesa area of San Diego and immediately north of the U.S./Mexico Border. The site involves the mass grading of 59 "mixed industrial" pads and improvements to adjacent streets. The San Diego Regional Water Quality Control Board R9-2007-0001 has directed Copermittees within the County of San Diego to implement Hydromodification requirements to limit discharge and duration of stormwater runoff. By complying with these Hydromodification Requirements outlined in the Final Countywide Model SUSMP, two detention basins referred to as East Detention Basin and West Detention Basin are required. See table below for Detention Basin properties.

Detention Basin Properties	East Basin	West Basin
Volume (ac-ft)	18.5	32.5
Surface Area (acres)	1.4	4.0
Depth (ft)	17.8	9
Outlet Orifice (inches)	3.6	4.7
Drawdown Time (days)	9.0	16.0

The purpose of this vector control plan is to identify best management practices that will be implemented on the project site to minimize vector breeding sources associated with the proposed detention basins. Both detention basins exceed the maximum drawdown standard for County of San Diego which is a maximum of 72 hours (County of San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance). Drawdown times exceeding 72 hours may result in vector breeding. This vector control plan was prepared to control potential mosquito breeding for the two proposed detention basins.

Description of the Facilities

Each detention basin will have a designated lot as part of the Tenative Map. The perimeters of the lot include "mixed industrial" pads to the east, north, and west with the U.S./Mexico border to the south. The purpose of the basin is to reduce peak runoff and duration of storm water and provide water quality treatment. The outlet orifices for the basins are 3.6 inches and 4.7 inches. Since the orifice size for the detention outlet is

relatively small, the design of the outlet structure will include a perforated pipe to eliminate trash that may clog the orifice as well as an emergency spillway.

Goals of the Plan

Given that a vector is any insect, arthropod, rodent or other animal of public health significance that can cause human discomfort, injury or is capable of harboring or transmitting a causative agent of human disease, the objective of this *Vector Control Plan* is to prevent mosquito breeding.

This Vector Control Plan is also an agreement with the *County of San Diego* to affirm a commitment to control mosquito breeding as required by the State of California Health and Safety Code § 2060-2067.

Description of Water Management

Prevention of mosquito breeding will utilize best management practices as advised by the *San Diego County Department of Environmental Health* (DEH). These include the following:

- Semi-annual (early Spring and Fall) removal of basin emergent vegetation or when recommended by the DEH *San Diego County, Vector Control Program.*

- An alternative to the basin clearing would be removal of swaths or patches of vegetation on a quarterly basis. No stand of cattails would be larger than a nominal 20 feet wide by 10 feet deep (200 sq. feet surface area) and all cattail stands will be separated by 10 feet of non-vegetative water.

- Standing water shall not have emergent vegetation, e.g. cattails, sedges, etc. in excess of 50% of the surface area.

- Emergent vegetation will be controlled by hand labor, mechanical means or by frequent clear cutting. Herbicides may be used as needed to control re-growth.

    - *The clearing is intended to prevent habitation for mosquito larvae.*
    - *Removal of the vegetation by hand will be the preferred method in order to lessen the re-growth frequency and density*

- Foot pathways will be maintained for surveillance and abatement methods. These will be a minimum of 5 feet wide to allow access to the water without disturbing the emergent vegetation.
- Trash and debris in the basin should be removed semiannually or as needed to prevent clogging of the outlet structure.
- The drawdown time of the detention basin shall be monitored after each rain event 12 hours or longer. If the drawdown time exceeds 72 hours and mosquitoes are present, mosquito larvicide shall be applied by a certified professional.
- The owners will educate themselves on the mosquito life cycle, potential breeding sources, and the importance of managing mosquitoes.

Proper maintenance and best management practice implementation for the detention basins will be funded by the owner, Paragon, or subsequent owner.

Access for Vector Control

The *County of San Diego* and any DEH authorized agent is hereby granted ingress for purposes of vector control and public health related activities. This includes the introduction of mosquito fish, placement of adult mosquito monitors or any other best management practice used by DEH.

Agreement

Name/Title Applicant	Date
Gregory S Lawson	2-16-10
Name/Title DEH agent GREGORY S LAWSON, SR. VECTOR ECOLOGIST	Date